An Abſtract of a Letter from Mr. A. Leevvenhoeck *of* Delft, *dated* Decemb. 28*th*, 1683. *concerning* Scales *within the mouth, the ſcaly* Child *that was ſhewn, the* Anatomy *of the Slime within the Guts, and the uſe thereof.*

IN my Letter of the 17*th*, *September* 1683. I ſaid that our Skin was covered with Scales. I have ſince that time examined the *Cuticula* of the inſide of the Mouth, and chiefly that of the under Lip; which I find to be covered with *Scales*, greater and broader than thoſe upon the Body; but they are withal thinner. *Fig.* 1. is a *Scale* which I chooſe out as one of the perfecteſt and moſt intire. Theſe *Scales* had more lines or ſtreaks running over them, than the *Scales* had which grew on the outſide of the Body, the lines I take to be channels or remainders of vapours breathed thro the Skin. Every *Scale* alſo had a great many ſmall Globules upon it, very tranſparent, as is to be ſeen in the *Figure*.

Another *Scale* lying thereby, had its circumference as *Fig.* 2. But as the *Scales* of our Body, lying over one another, ſo as to be three deep, are the cauſe of the skins appearing white, as I have formerly ſaid (for diaphanous Particles laid upon one another, and not too cloſe, make a white; for which reaſon we ſee that *Paper*, *Spittle*, *beaten-Glaſs*, and *Snow* are white): ſo the *Scales* of our Mouth, (for as much as I can yet find) lying but a little over the ſides of one another, ſuffer the redneſs of the fleſh and blood to appear through them; and for this cauſe the Lips and Mouth are red.

I have often wondred what ſhould be the cauſe; that a ſingle hair lying upon the skin cauſed ſo great a tickling! But if the Skin be covered with *Scales*, and the outward bark of the hair be very rugged, it will not be ſtrange,

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ſtrange, that a hair lying over the edges of one or more *Scales*, ſhould cauſe a motion in them, which being communicated to the skin, may cauſe that ſenſation.

There has been carryed thro this Land to be ſhow'd, a *Child* about ten years old, whoſe Body (as they ſaid) was all covered with *Fiſh Scales*. Having heard very much of this wonder, I went to ſee it, but found it much different from the Report of it. For there appeared to my naked Eye and Microſcope, no part of the Body which I could ſay was covered with *Fiſh Scales*, but rather with a thick *Callus*, and more eſpecially within the hands and under the feet; upon ſome parts of the Body alſo there were Excreſcencies like Ridges of *Warts*.

I deſired of thoſe that took care of the *Child*, that I might have one of the Particles, or *Scales* pluckt from the Body; but they refuſed me, under pretence that the blood would follow it, when I lookt earneſtly upon the *Child*, I perceived they were diſpleaſed with me; they told me, that the *Scales* fell off four times a year, and others grew in their places: and that daily ſome of the *Scales* were left in the bed, but they ſtill refuſed to give me, or ſell me any of them; at length in ſearching carefully about the Room I found a Cluſter, which my repeated Obſervations do confirm to be nothing but natural and ordinary *Scales*, ſuch as bodies uſe to be covered with. I afterwards put it in water. and let it lye ſome hours, till the parts would ſeparate with the leaſt touch into a thouſand ſmall *Scales*. Theſe were more then ordinarily beſet with Globules, and thereby were very like the *Scales* of the Brawn of the inſide of the hand. But no otherwiſe remarquable.

I have been a long time deſirous to examine the ſlimy matter which lines the inſide of the Guts, and ſo much the rather becauſe it is generally eſteemed as a ſuperfluous part, and fit to be removed; whereas on the contrary, it appears to me, to be a part inſtrumental, and neceſſary

ceſſary for the uſes of the Bowels. I took then this woolly ſubſtance, and having cleared it from the Excrement, as much as I could, I found a great number of very thin blood Veſſels branched out, and lying ſo thick together, that the ſpace of half the Diameter of a hair was not void between the branches. Beſides the blood-veſſels, there were alſo other veſſels that had no diſtinguiſhable colour, which I ſuſpected to be Limphaticks or Lacteals: I could not diſcern any Membrane that encompaſſed them, but all about them lay a glutinous clear ſlime, beſet with ſmall Globules, which ſlime and Globules I took to be the Excrements lying upon the Guts, but when I went to ſcrape gently this ſlime away, I found that I not only wounded the bloodveſſels, but tore away many blood-veſſels, and other veſſels together.

Theſe blood-veſſels do not ſpread their Branches on all ſides, like the blood-veſſels in other parts of the body, but as they lye in a Bow, ſend all their Branches inward, and none outwards: They alſo lye ſo cloſe by one another, that I imagine ten thouſand of them may be in the ſpace of an inch ſquare; I have deſcribed the circumference of one of theſe veſſels in *Fig*, 3. *A. B. C. D. E. F. G.* which circumference is no greater then to be covered with a ſand: The thickneſs or Diameter is about the *25th.* part of a hair of my head, from the inſide many ſmall veſſels iſſuing out doe as it were joyn together, but of theſe only 4 are ſpecified as in *Fig.* 3. *B. L. E.* and *C. L. F.*

Fig. 4. *H. I. K.* is a ſmall veſſel, and though I have placed it at ſome diſtance from the former, nevertheleſs it was partly covered by it, as is uſual with the reſt of them to cover one another: The Bows alſo lye all the ſame way, bending towards the paſſage of the Excrement out of the Guts.

I could not track *H. G.* and *H. K.* any further, by reaſon

reaſon that they hid themſelves among the other parts of the woolly ſubſtances.

From the foregoing Obſervation, I have been doubtful whether the Arteries and Veins were not in this place joned together, *viz*. whether *A.* were not an Artery, and *G.* a Vein, for among all the Experience that I have had of the blood-veſſels I never perceived ſuch a probability of an *Anaſtomoſis*. For in other places the Arteries being variouſly diſſeminated for the nouriſhment of the parts, the veins are ſo likewiſe, for the carrying the blood back again into the heart: but in this place the Arteries going no further than the hollow of the Guts, ſeem to have no other buſineſs then to empty themſelves into the Veins.

Theſe obſervations alſo make me more then ever reject the Opinion, that the Extremities of the Lacteal and Limphatick Veſſels have mouths or openings, whereby they receive and take in the Chyle out of the Guts, for I am perſwaded that the extremities of the *Lacteæ* in the Guts are as well covered with their Coat or Membrane in that place, as in other parts of the body, which nevertheleſs will not hinder the food from paſſing out of the Guts. For let *Fig*. 5. *A. B. C. D. E.* be the root of a tree, the nouriſhment that this Root receives out of the Earth, ſhall paſs no eaſier thro the Extremities *A.* and *E.* than thro any other place about *D.* or *C.* which is of the ſame bigneſs. For example, I have ſeen the ſmall Roots of a Vine an hundred times thinner than an hair of my head, their farther ends *A.* and *E.* take up a place of the one thouſand part of the bigneſs of a ſand. Now if a place be no bigger than this, the moiſture or nouriſhment of the Tree, will as well paſs thro any part of the Bark or wood of the Root, as thro the places *A. E.* So that a thin capillary Root may as well receive the nouriſhment at any other place as at the end. And as the Arteries, whoſe Coats are made up of a threddy ſubſtance, can ſtrain the blood thro them,

(as I have formerly ſaid) ſo the nutritive Juice alſo may paſs thro the threddy Coats of the blood,water,and milk-veſſels: and in the ſame manner, the ſmall Branches of the veins may take up ſubſtances out of the Bowels, and carry them to the heart.

This will not ſeem ſtrange when we conſider, that if a milk,water, or blood-veſſel, be a thouſand times leſs than a hair of ones head, the Coats of them muſt needs be very thin, and the threds whereof the Coats are made yet thinner. How eaſy muſt moiſture paſs thro the ſides of ſuch Veſſels; eſpecially when the matter which is to enter into the veſſels is thinner than that which is already contained in them.

It has been objected, that while the paſſage into the Veſſels is ſo open, a quantity of Air and Wind may alſo get into them. Now that you may ſee how that the moiſture may paſs out of the Bowels into the Veins, and the wind not paſs, I made this following tryal. I took an Ox Bladder, blew it up, and let it dry as *Figure 6. A. B. C. D.* I then took a piece of a Hog's Gut made clean, about the length of a ſpan, and tied it up at *E.* then I put into it water, till the Gut was about a quarter full: Afterwards I forced in three quarters more of Air, binding it faſt at *F.* the Gut then lay upon the Bladder as *E. F.* I then hung them in a Chimney where was made but little fire, and I found that the water in the Gut did not only moiſten the Bladder, where it touched it, but run down in two Channels by the ſide of the bladder; in the ſpace of ſixteen hours all the moiſture in the Gut was run out, without the leaſt Air, nay the Gut ſeemed as ſtiff, as when it was firſt blown.

Let us now compare the Guts to the Bladder, and the Chyle and Wind in the Guts, to the wind and water in the hogs gut, then ſhall the Guts let the moiſture paſs through them, but not the Air.

Among the aforeſaid blood-veſſels and other veſſels lying

lying within the Guts, I ſaw a matter ſeeming firſt to conſiſt of Globules. Afterwards it appeared like little Guts within the great Guts: at length it proved to be ſhort threds, whoſe one end was partly covered with the aforeſaid veſſels, and the other end was faſt'ned to a Skin or Membrane, probably the ſame with that called by the Anatomiſts the inner-moſt Coat of the Bowels.

Fig. 7. *A. B. C.* are the ends of the threddy ſubſtance, otherwiſe called the ſlime or woolly ſubſtance, which I ſhall now name the inner-moſt Muſcle of the Bowels, their Appearance (if the blood-veſſels be removed) is as in the *Figure*; the threds making the inward Muſcle of the bowels, if they be lookt on, on one ſide are as *A. D. E. C.* the thickneſs of theſe threds, is leſs than a hair of my head: they are very tender, and break upon the leaſt touch: I have ſometimes thought that each of theſe threds conſiſted of ſeveral threds joyned together, or that every thred had a Membrane; for all of them ſeem to be very cloſe linked together.

This woolly ſubſtance (which I have deſcribed) I conceive may be of great uſe; for the threds muſt be longer, and lye cloſer together, and have little moiſture betwixt them, whilſt the Gut is empty and crumpled; but when the gut is full and diſtended with Victuals, the threds muſt be ſhorter, and lye not ſo cloſe together as when the gut is contracted. By which means, the blood-veſſels *Lacteals* and *Lymphaticks* come more eaſie to receive their liquors into them. For example,

Let us imagine that in the *Fig.* 8. *A. B. C.* is a gut cut acroſs as it is empty and ſhrunk; that *A. D.* are the threds making the innermoſt Muſcle of the Gut, now if the gut be full and ſtretched to the wideneſs of *E. F. G.* the threds *A. D.* will be contracted as *E. H.* not only becauſe they are cloſe compacted together, as they lye among one another, but alſo becauſe the blood-veſſels and other veſſels running between them, keep them as it were bound up: for if they were ſeparated from one another, then would the groſſer parts of the Excrements get among them, as often as the Bowels are extended. Now the threds not being crowded ſo much when the guts are ſtretched, the Chyle enters more eaſily into the veſſels lying among them, and afterwards upon every Contraction of the guts (becauſe then the threds are ſqueezed together) is conveyed into the body.

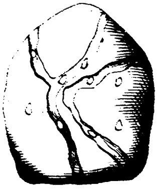
I ſaid before that the threds which make the innermoſt Muſcle of the Bowels, lye with their one end in the hollow of the Bowels, which end is for the moſt part covered with blood-veſſels and other veſſels. Their other end is faſtened to a Skin or Membrane which probably is taken by Anatomiſts for the Innermoſt Coat of the Bowels, as in the line *D. E. Fig.* 7. may be ſeen. In this Membrane I diſcovered many Globules of fat, which in ſome places lay cloſe and crowded together, and therefore appeared in different ſhapes. In other places lay ſome fat Particles, at a diſtance from the reſt, theſe all inclined to an oval ſhape as *Fig.* 9. In another place a little diſtant lay ovalliſh Particles in a right line, as *Fig.* 10. In another place the Particles lay ſo thick together, that they crowded one another, and appeared as in *Fig.* 11.

A Letter formerly written to Mr. H. O. *containing the Projection of the Threds of* Spiders, *and* Bees *breeding in caſes made of Leaves, as alſo, a* Viviparous Fly, &c. *by* Dr. M. Liſter.

I am glad to underſtand my Letter came ſafe to your Hands. Give me leave to entertain you now about the Subject of *Inſects*, which I ſee by your laſt *Phil. tranſ. Num.* 65. many perſons are now curious in. And

Philoſoph. Tranſact.

Fig: 1.



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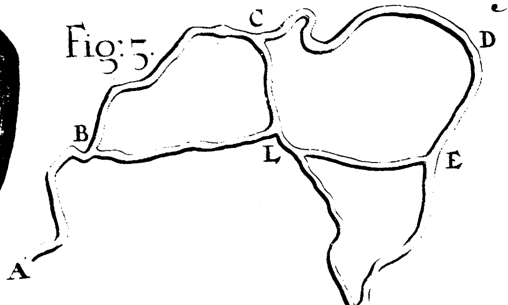

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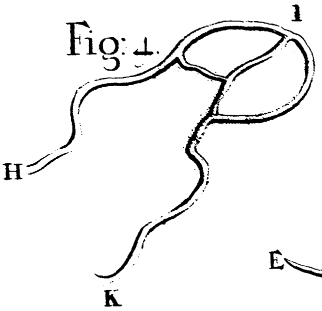

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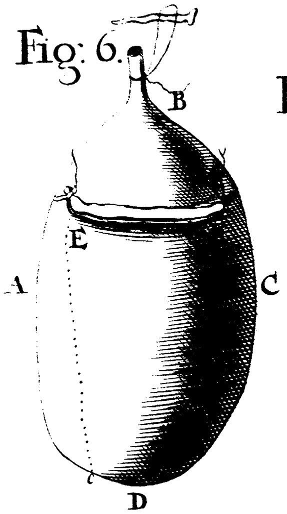

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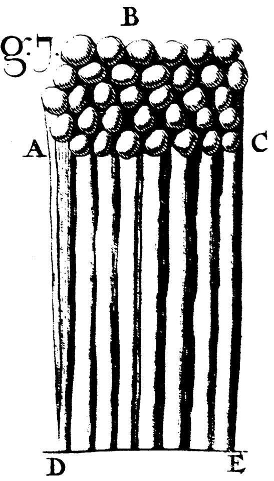

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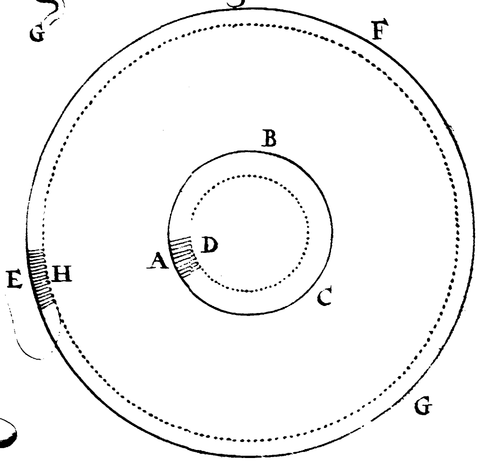

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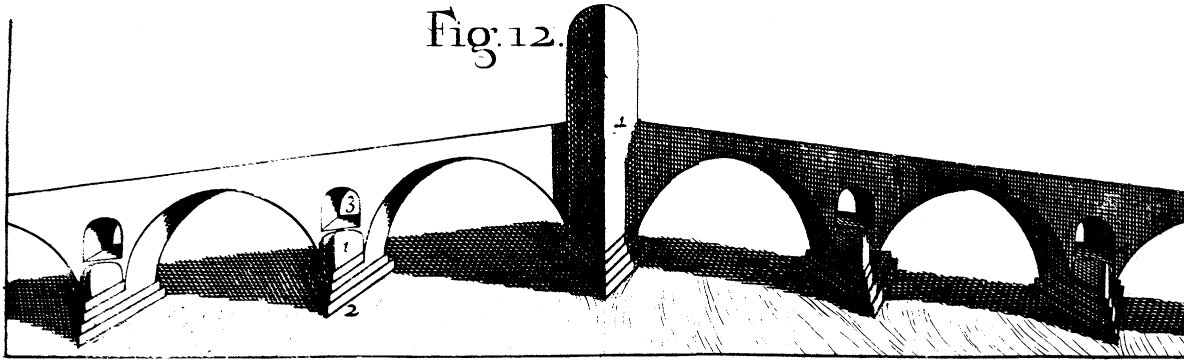

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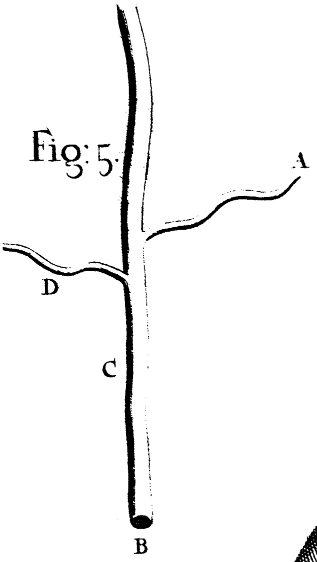
Fig: 5.



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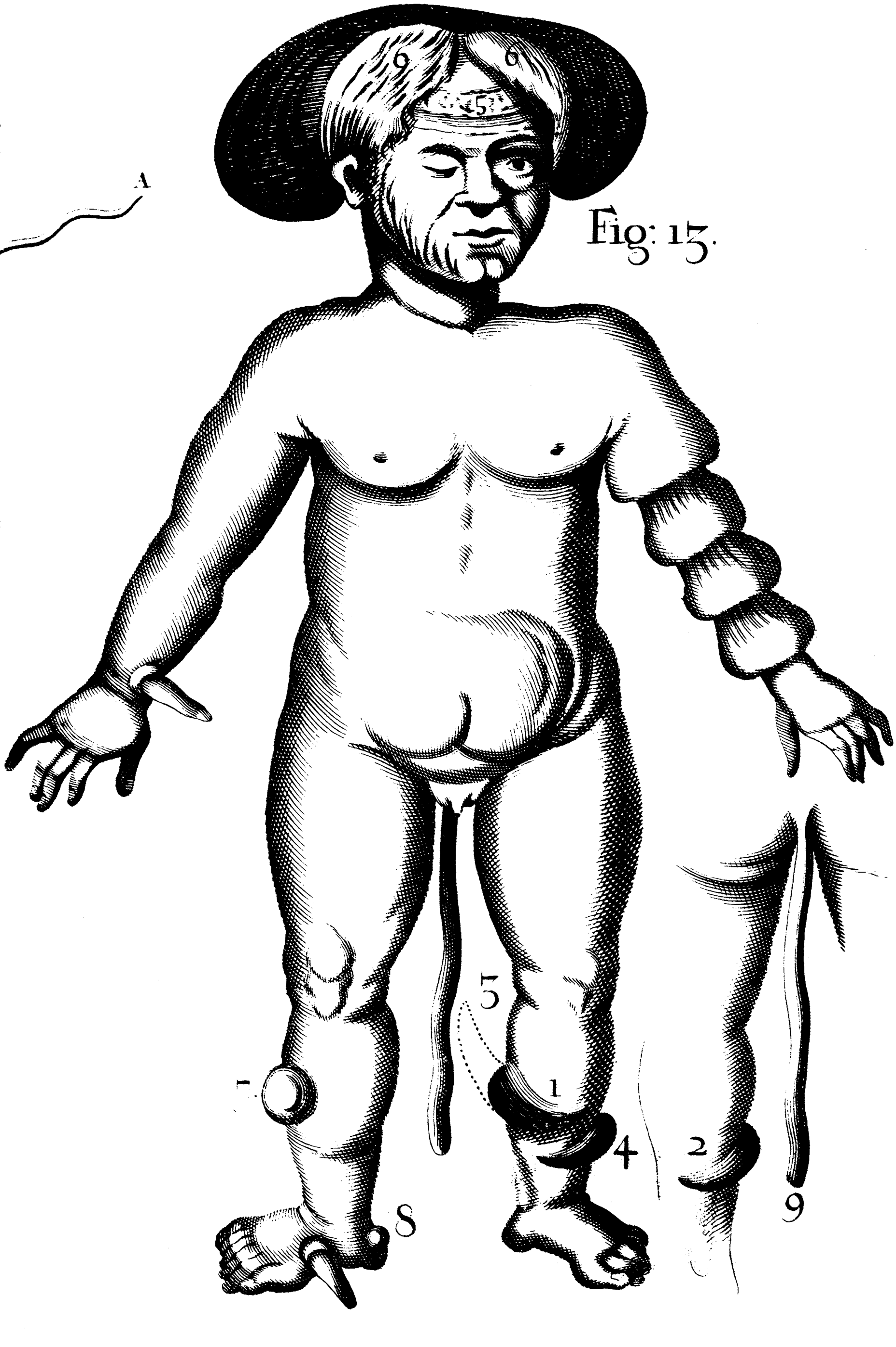

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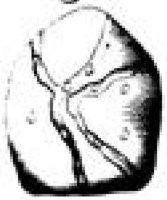
Fig. 1.



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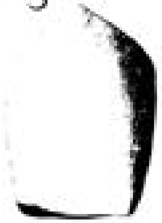

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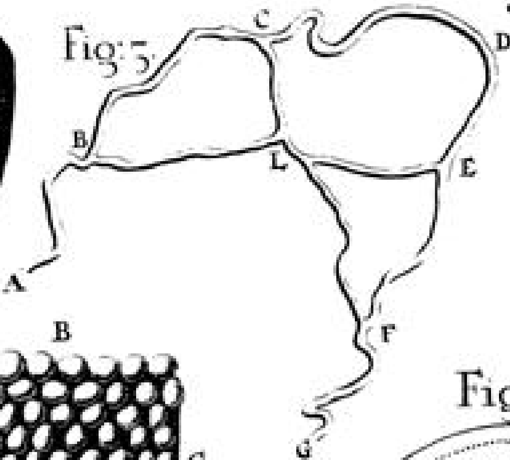

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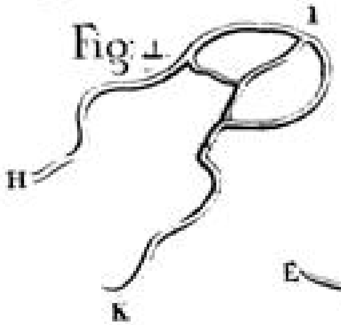

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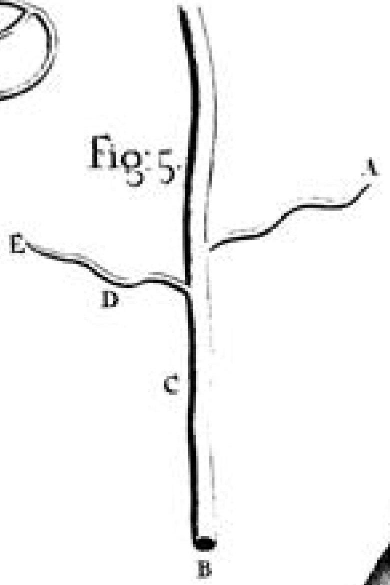

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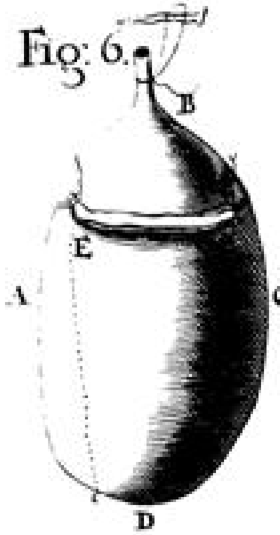

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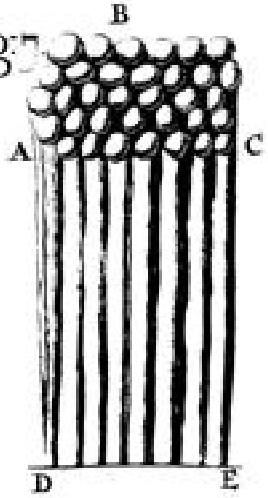

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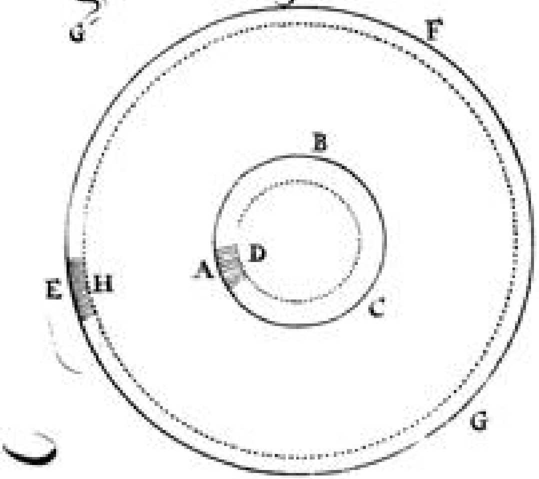

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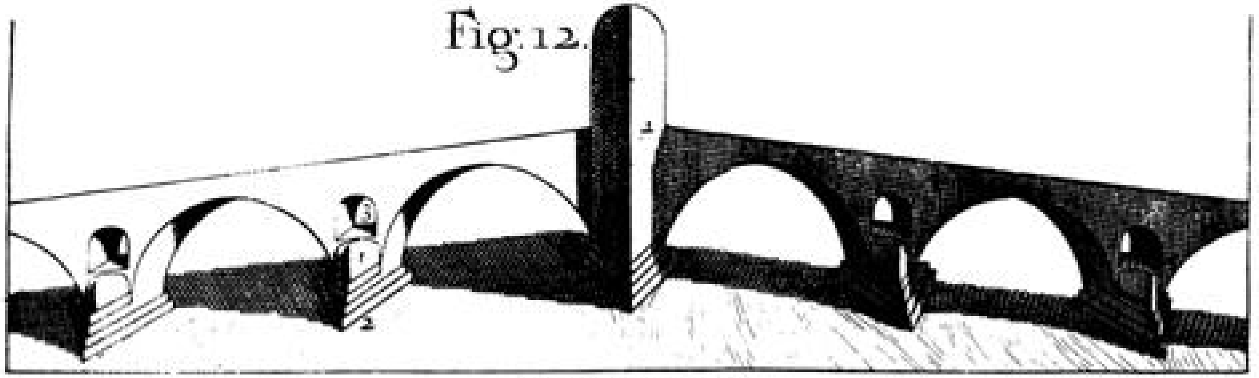

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Fig. 15.